Looking into Landfills

by Todd Paddock,
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Like many archeologists, the University of Arizona's Bill Rathje has spent a good deal of time sifting through former garbage dumps. Unlike other archeologists, he has been investigating modern landfills. And what he has learned about what's in a landfill has raised a few eyebrows.

Dr. Rathje and colleagues are part of the Garbage Project, a multidisciplinary research program at the University of Arizona. According to the researchers, they started the project because, "In 1987, in the midst of a national furor over refuse and landfills, we were shocked to discover that no one had ever dug into an actual landfill to determine what was inside and what has been happening to it. We could not resist the opportunity."

Since then, Dr. Rathje's team has excavated four landfills: one in Tuscon, Arizona, two in the Bay Area of California, and one in Chicago, Illinois. Using a truck-mounted bucket auger, Dr. Rathje's team bored a shaft down as far as 90 feet into a landfill, taking samples of the garbage at 10-foot depths. They then analyzed the garbage for its various constituents, by weight and volume. Previous estimates of what's in landfills have been based on studies of the waste before it was buried, or data on what is manufactured.

And it makes a difference. Based on their research, the Garbage

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• Environmental Regulation
• Biodiversity
• Environmental Studies in Mongolia
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• Nonpoint Sources I
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• Pollution in Surface Waters
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• Inside the War on Chlorine
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• At Odds on Environmental Policy
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• The Goal of Zero Discharge
• Sediments -- A Little

Project reports that "First and foremost, much of the information which is used to plan environmentally responsive policies for municipal solid waste landfills-- in other words, what we think is in landfills and what happens to it over time-- may be based more on myths than on facts."

For instance, they found that fast-food packaging, which has been estimated to take as much as ten percent of the volume of waste in a landfill, actually averaged about one quarter of one percent of the volume. Disposable diapers, which have been estimated to take as much as five percent of the volume of a landfill, actually averaged about one percent of the volume.

Other items took up surprisingly large amounts of space in a landfill. Newspapers averaged about 14% of the landfill volume. They were the single largest item, by both weight and volume, in the landfills examined by the Garbage Project. The Garbage Project reported that phone books also took a significant amount of space. However, the actual volume of phone books was difficult to estimate, because most are thrown away during a short one- or two-week period, once a year.

They reported that plastic bottles are flattened by the tons of garbage and dirt above them, greatly reducing the amount of space they take up. Many glass containers, on the other hand, are not squashed. If we want to extend the life of our landfills, advocating a return to glass bottles will only help if they are recycled, not thrown away.

Dr. Rathje and his team also verified what other researchers have found in studies of waste in simulated landfills: biodegradable refuse breaks down extremely slowly in the anaerobic (oxygen-free) conditions of a landfill. The Garbage Project dug up foods such as hotdogs and pastries that were buried for as much as fifteen years, but were still recognizable. Many newspapers were readable (in fact, they are used to verify when the waste was buried), and grass clippings were often green.

They report that biodegradable waste made up more than sixty-five percent of the waste in the landfills, by volume, and changed little, even after being buried for more than ten years. Paper and cardboard made up more than fifty percent of the volume of waste in a landfill, yard waste averaged about five percent, and food about one percent.

Other researchers have been investigating for many years the degradation of waste in landfills, and had some success at accelerating the process. For example, Dr. Riley Kinman and associates in the Department of Civil and Environmental Engineering at the University of Cincinnati, have identified more than thirty variables that can affect the degradation process in their simulated landfills.

They've found that adding additional moisture or nutrients can increase the rate of degradation. Mixing sewage sludge with refuse

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• Looking into Landfills
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can increase the rate of degradation, because the sludge provides additional moisture, microorganisms, and nutrients.

Dr. Kinman cautions, however, that even using these techniques, degradation in landfills is a very slow process. "In our landfill simulators, even the most rapid degradation resulted in only a five percent drop in volume after ten years. And in a real landfill, there are many variables we have no control over, so we would expect the rate of degradation to be even slower."

Is there any reason we should want to accelerate the degradation process in landfills? According to Dr. Kinman, "We're trying to understand what goes on in a landfill for several reasons. First, for the best protection of the public health and the environment. Second, to see if you can produce energy."

Anaerobic degradation in landfills produces methane gas, and this gas has commercial value. As Dr. Kinman explains, "If you are a company investing money in a landfill in order to produce gas, you want to produce that gas as soon as possible, in order to get your money back. As long as we continue to protect the public health and the environment, I don't see any problem with that."

Sources

Source Reduction and Landfill Myths
a report by W.L. Rathje, W.W. Hughes, G. Archer, and D.C. Wilson. Presented at the National Solid Waste Forum on Integrated Municipal Waste Management, July 17-20, 1988, Lake Buena Vista, Florida.

Dr. William Rathje and colleagues can be reached at:
The Garbage Project
Anthropology/BARA
University of Arizona
Tucson, AZ 85721; Tel (602) 621-6290

For further information on landfill engineering and design:

Dr. Riley Kinman
Department of Civil and Environmental Engineering
University of Cincinatti
Cincinatti, OH 45221; Tel (513) 556-3694